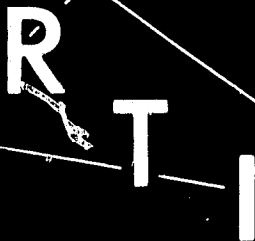


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RESEARCH TRIANGLE INSTITUTE

QUARTERLY PROGRESS REPORT

Contract No. NAS5-26442

E82-10160
CR-168543

A Study of Model Parameters Associated With
the Urban Climate Using HCMM Data

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1.0 Introduction

The Research Triangle Institute (RTI) is using infrared and visible data from the Heat Capacity Mapping Mission (HCMM) satellite to study the intensity of the urban heat island, commonly defined as the temperature difference between the center of the city and the surrounding suburban and rural regions, as a function of changes in the season and changes in meteorological conditions in order to derive various parameters which may be used in numerical models for urban climate. The analysis is focused on the city of St. Louis; and in situ data from St. Louis will be combined with HCMM data in order to derive the various parameters. The following are research tasks which we performed in order to meet the overall objective:

- 1) Determine specific case studies and obtain HCMM data and in situ data for each case study.
- 2) Establish ground temperatures using HCMM data corrected for the effects of atmospheric absorption.
- 3) Compare the corrected and uncorrected HCMM data to determine the magnitude of the error induced by atmospheric effects.
- 4) Compute the friction velocity, the Monin-scale temperature, the Monin-scale length, the surface roughness, and the eddy exchange coefficient using the HCMM in situ data.
- 5) Compute the heat island intensity using both HCMM ground temperature and in situ surface air temperature.
- 6) Determine estimates of anthropogenic heating using a boundary-layer model and parameters developed in Tasks 3) and 4).

2.0 Progress to Date

HCMM visible and infrared imagery were ordered from the Goddard Space Flight Center (GSFC). These data were received from GSFC and examined to determine the best case studies for the purposes of this research project.

Twelve case studies were selected and the CCT's were ordered for those data. The case studies are listed below.

June 09, 1978	Sept 03, 1978
June 10, 1978	Nov 05, 1978
June 14, 1978	Nov 10, 1978
June 19, 1978	Feb 26, 1979
June 26, 1978	Aug 31, 1979
Sept 02, 1978	Sept 27, 1979

After the CCT's were ordered for the above-mentioned dates, the Project Leader contacted various agencies in the city of St. Louis to obtain in situ data. As a result of this effort, in situ data has been obtained from sixteen stations scattered about the city of St. Louis. Six of these stations are in the city of St. Louis, five being part of the St. Louis Air Pollution Control Agency and one being a station operated by St. Louis University. Six stations are located in the St. Louis county. Five of these stations are operated by the St. Louis County Air Pollution Control Agency, and one is the U.S. Weather Bureau Station at Lambert Field. Four stations are located in Illinois, operated by the East St. Louis Air Pollution Control Agency and the Alton, Illinois, Air Pollution Control Agency. Winds and temperatures were obtained for the above-mentioned dates for which HCMM data were ordered. These data have been processed and are waiting to be combined with HCMM ground temperatures.

Upper-air meteorological data were obtained from U.S. Weather Bureau Stations which operate radiosonde systems nearest to St. Louis. These data will be used to correct the HCMM data for atmospheric effects. To date,

the water vapor and the temperature data have been processed, and atmospheric transmissivities have been computed for each of the case studies. The technique developed by RTI to obtain an atmospherically corrected temperature distribution for satellite data requires at least one ground temperature to be available in the region. Ground temperatures which will be utilized by the RTI technique will be those temperatures measured in the Mississippi River by the U.S. Army Corps of Engineers. Surface temperature data in the Mississippi River have been obtained for the dates mentioned above. These data are also ready for the processing of the HCMM data.

3.0 Problem Areas

A major problem area to date is the nonreceipt of the HCMM CCT's. These data were ordered the first week in February, 1981 and had not been received by mid-April, 1981 (9 weeks). The nonreceipt of the HCMM CCT's has delayed this project markedly. We are presently one month behind schedule and fall behind schedule more so as each day passes.

4.0 Work for Next Quarterly Period

During the next quarterly period, assuming the HCMM CCT's will have been received, algorithms will be completed to correct the HCMM data for atmospheric effects, to compute the friction velocity, the Monin-scale temperature, the Monin-scale length, the surface roughness, and the eddy exchange coefficients. The HCMM ground temperatures and the in situ wind and air temperature data will be combined to yield spatial analysis in and around the city of St. Louis of the parameters mentioned in the last sentence. The algorithm to estimate anthropogenic heating will also be developed and the parameters required to estimate the anthropogenic heating effects will be determined using HCMM and in situ data. Provided the HCMM

data are received shortly, at least one case study could be completed by the end of next reporting period.